

# Capabilities Composition

## Software Systems Technology Conference

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- ***Background***

- Today
- Tomorrow

- ***Getting There***

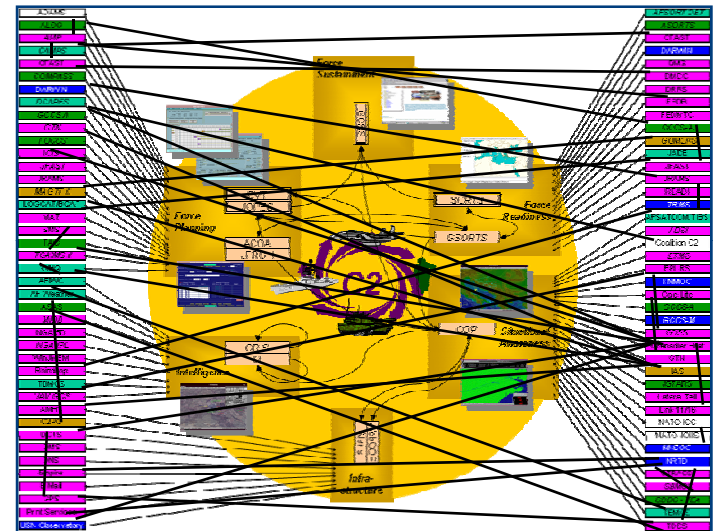
- Stakeholders
- The Challenge
- Governance (alignment of the pieces)
- Example: Navy Technical Reference Model (NTRM)
- Collaboration Environments
- Innovation & Composition

- ***Summary & Discussion***

# Where We Are Today...

## *A Systems focus....*

- Inflexible systems cannot be easily reconfigured to meet changing mission needs
- Systems are the centers of gravity, and all data is stored within them
- Multiple systems are often required to execute a mission thread
- Every link and interface must be tested/accredited
- Capabilities delivery & upgrades are expensive and time consuming

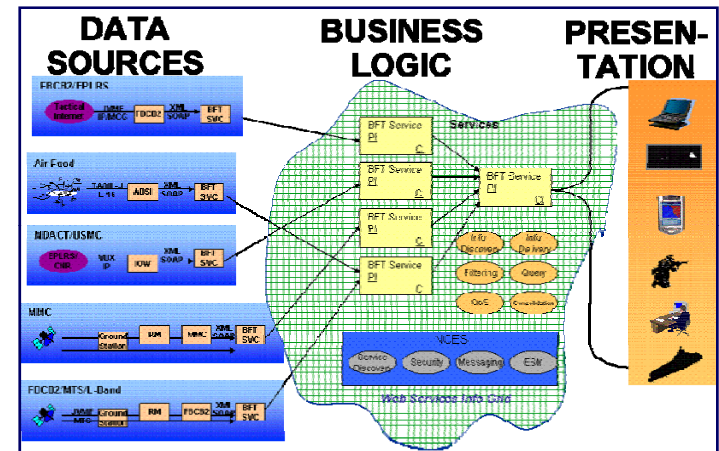


*Business logic (and data) is still largely buried in stove-pipe systems ...*

# Where We're Heading...

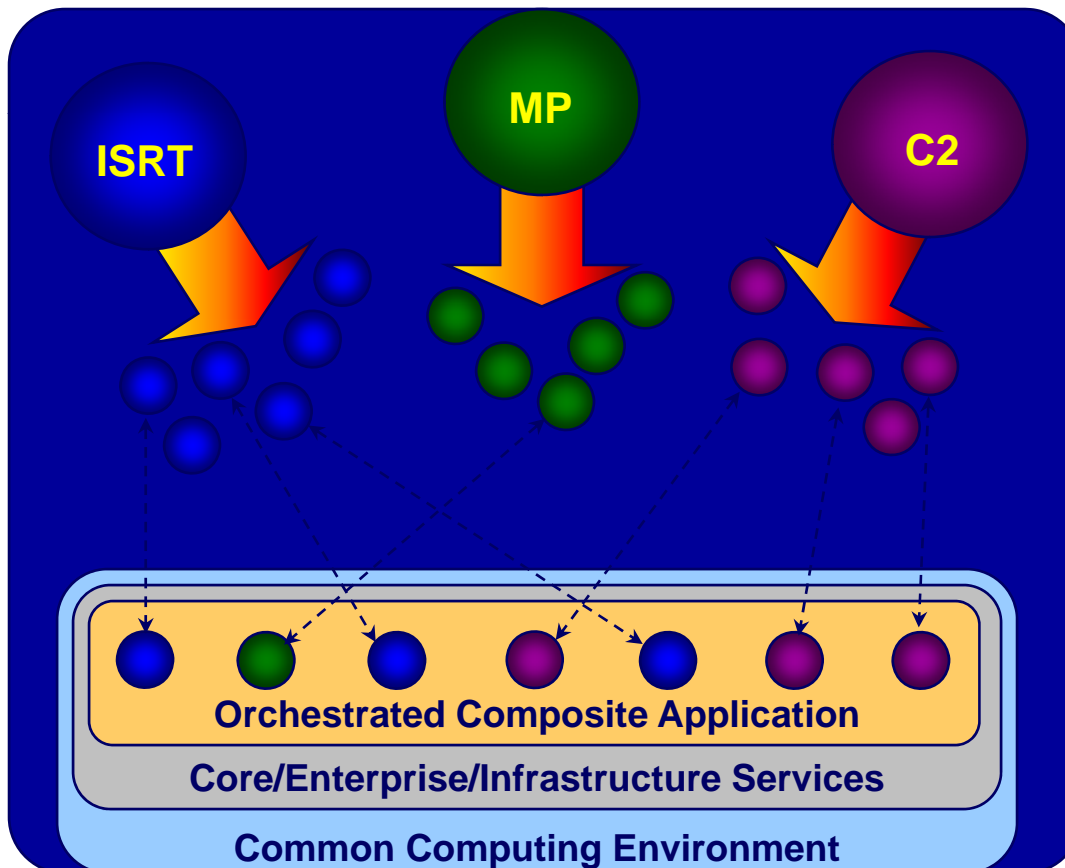
## ***A Mission Focus....***

- Far fewer connections, much more agile development cycle
- Data Sources are centers of gravity - data is stored within data enclaves
- Compose capabilities to meet warfighter / mission needs
- Expose and tailor business logic to meet mission needs
- Deliver component capabilities incrementally to meet dynamic mission needs



***Business logic (and data) is delivered through components rather than systems...***

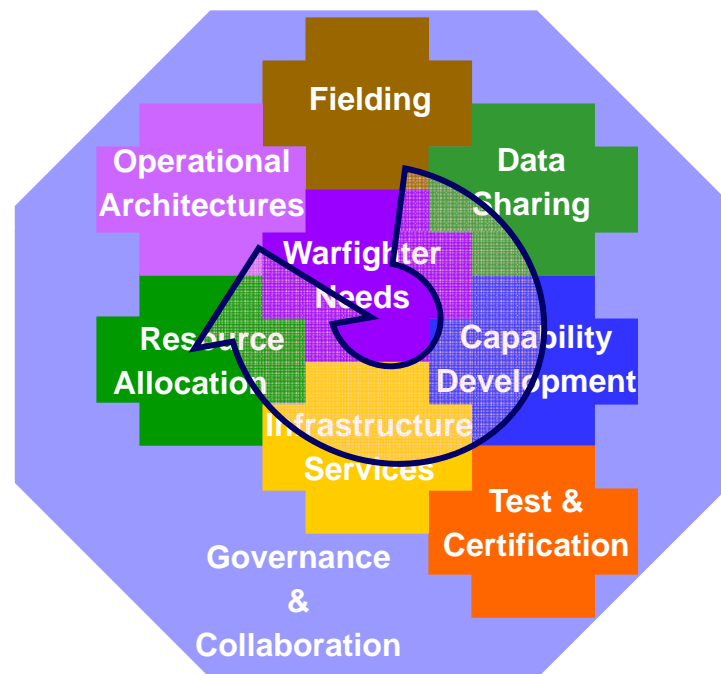
# Service Orientation of a Mission Thread



- Deliver **components** rather than systems
- Components are provided as **information services**
- Components can be arranged in any way to provide overall **composite application**
- Component design provides **flexibility, higher re-use, and better manageability**

# Getting from Today to Tomorrow...

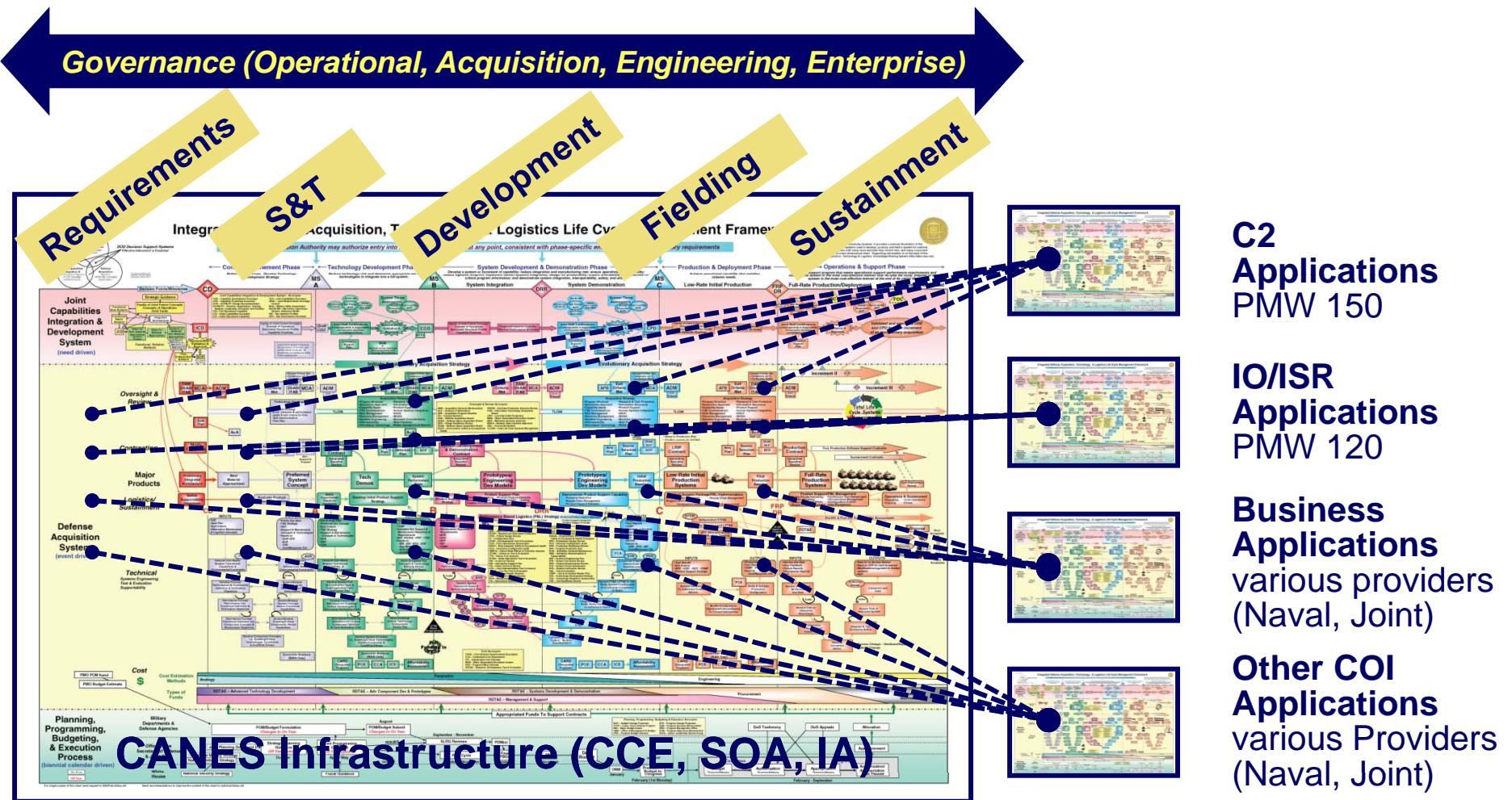
- *Warfighter Needs* define the goal
- *Operational Architectures* define deployable approaches to deliver mission capabilities
- *Capability Portfolio Managers* guide and drive capabilities developed and delivered for C2, BA, L, NC....
- *Resource Sponsors* use CONOPS, Scenarios, Mission Threads and wargames to determine appropriate investment areas
- *Operational Test Authorities* test systems and capabilities against mission thread, interoperability, and technical guidelines
- *OSD NII and Service Directives* guide NetCentric Data Sharing and Data Exchange
- *Programs of Record* direct and manage capabilities Fielding and life-cycle management



**Capability Composition focuses Data, Applications and Infrastructure on Warfighter needs**

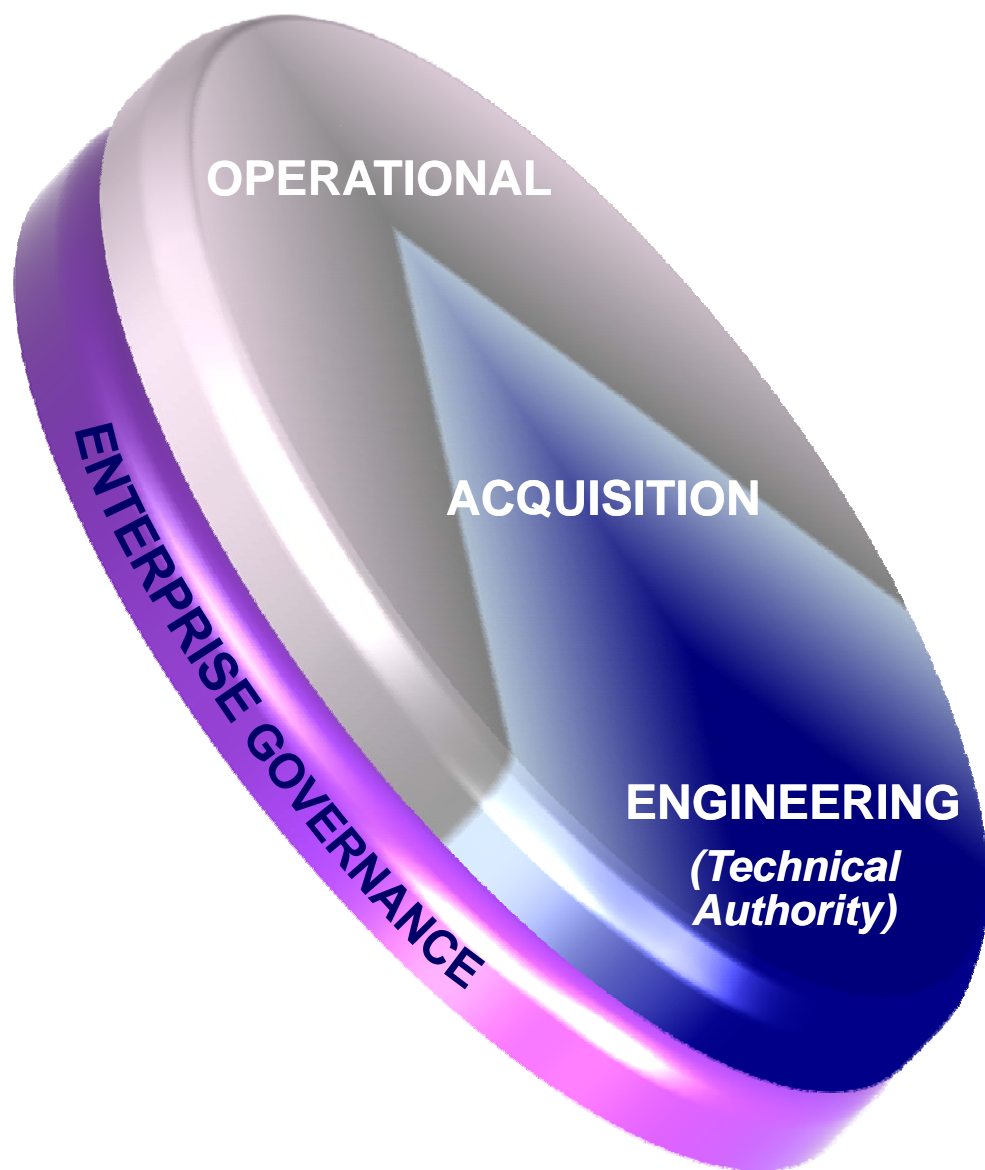
# The Challenge...

...using CANES as an example



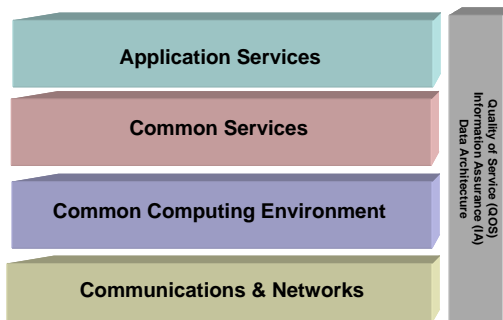
*Align & synchronize capabilities and processes to enable development...*

# Dimensions of Governance

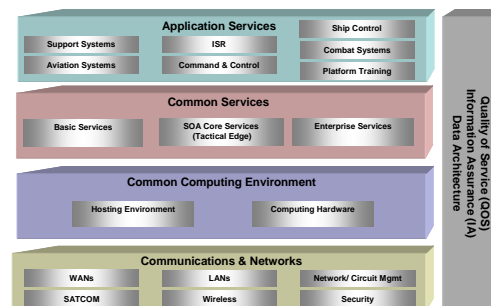


- *Portfolio Management of :*
  - Operational requirements
  - Acquisition priorities and funding
  - Engineering solutions
- Scale and align with the larger Service / Joint enterprise environment
- Leverage intersections between key elements of Joint and Service specific efforts

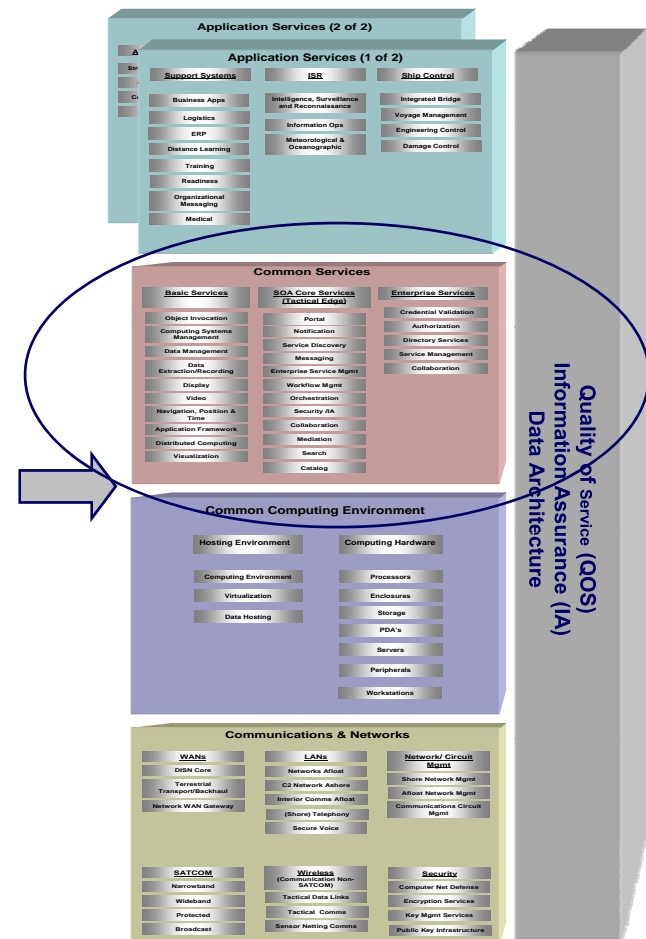
# Navy Technical Reference Model (NTRM) Overview



**Navy Technical  
Reference Model  
Level 0**



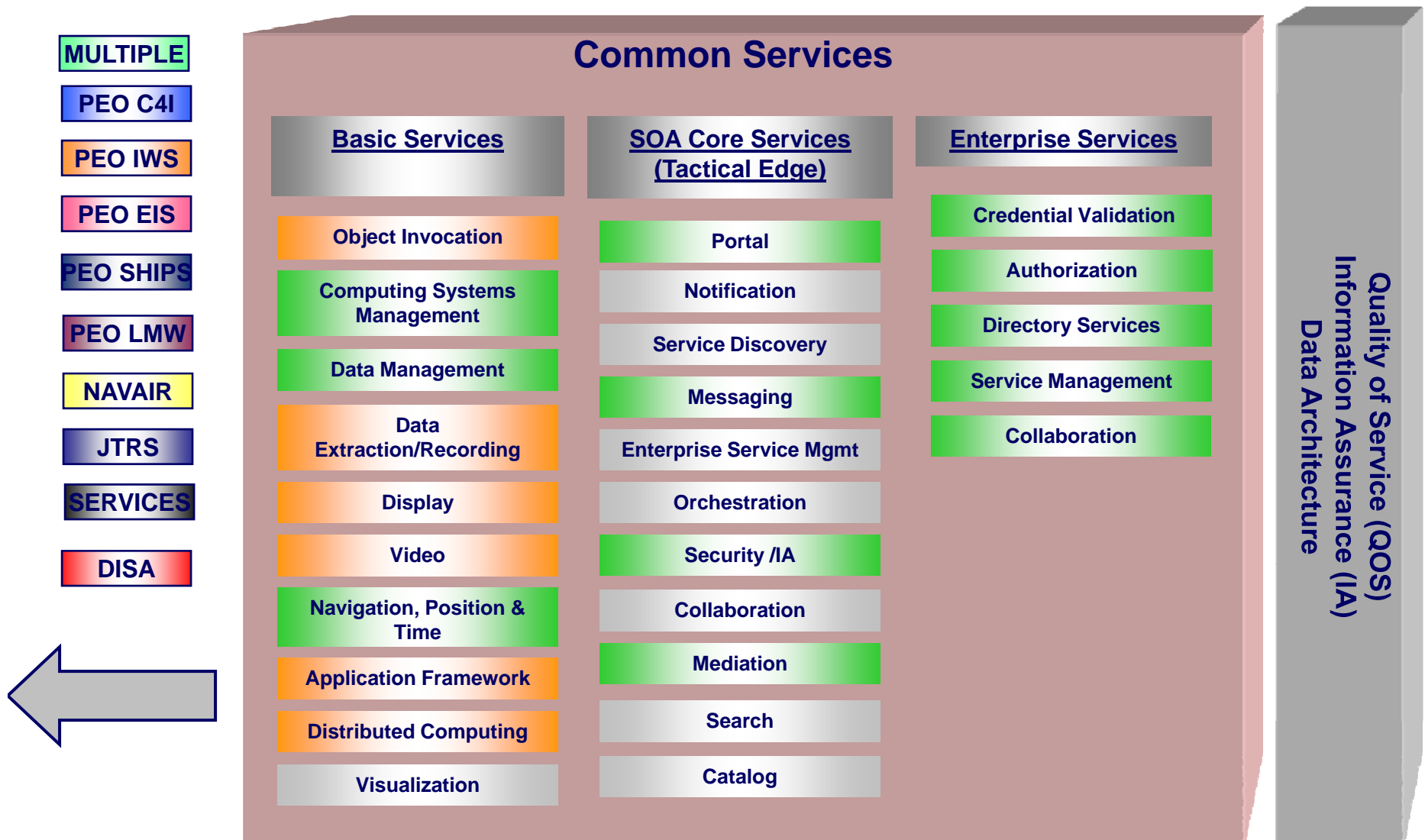
**Navy Technical  
Reference Model  
Level 1**



**Navy Technical  
Reference Model  
Level 2**

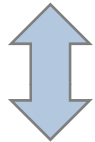
# NTRM Level 2

## *(With R&R Based on Existing Acquisition Efforts)*



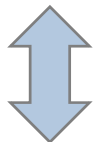
# ONR Core Services Architecture Evolution Reference Framework

## Core Services Reference *Implementation* (CS-RI)



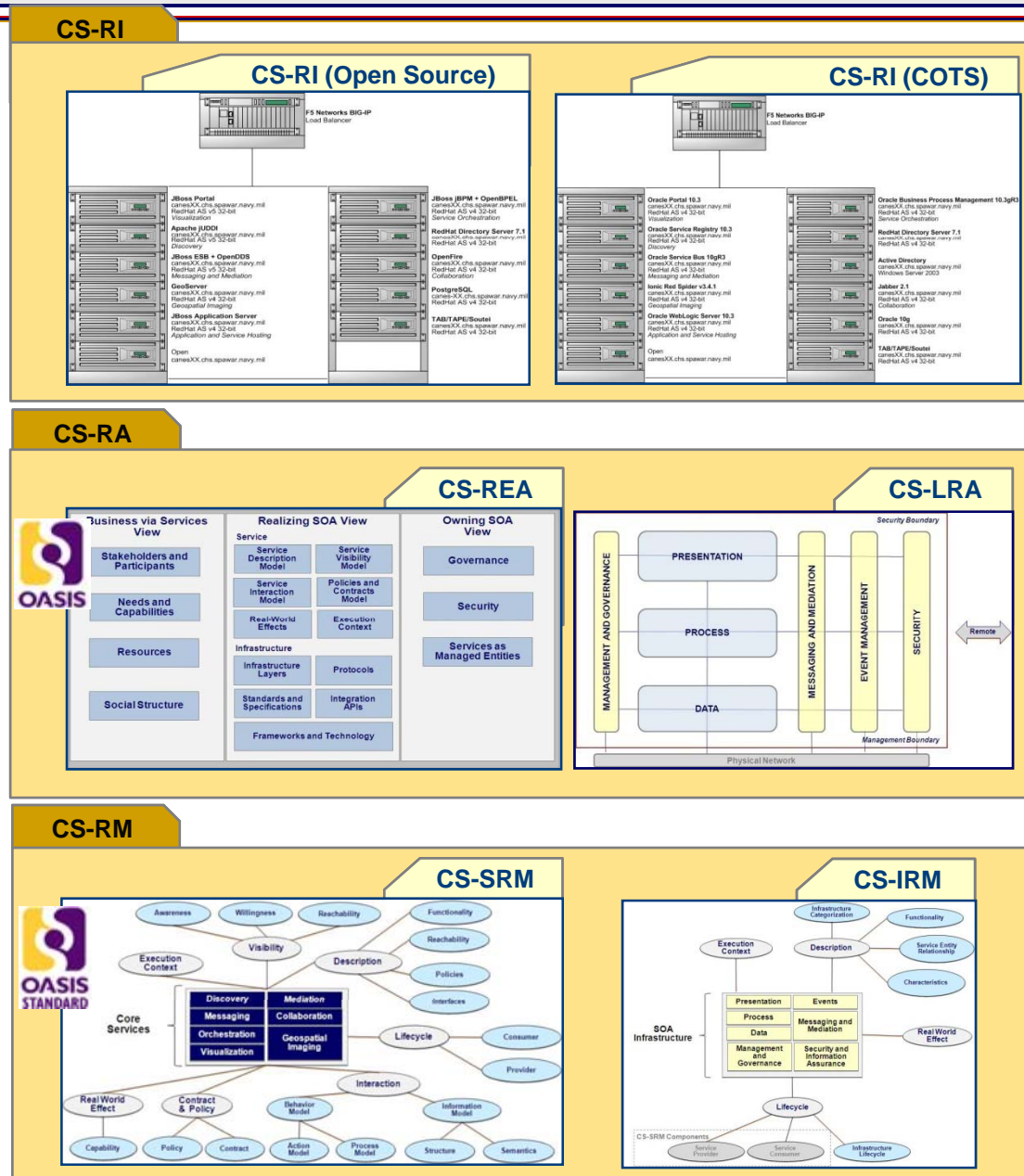
## Core Services Reference *Architecture* (CS-RA)

CS-Reference Element Architecture  
CS-Layered Reference Architecture



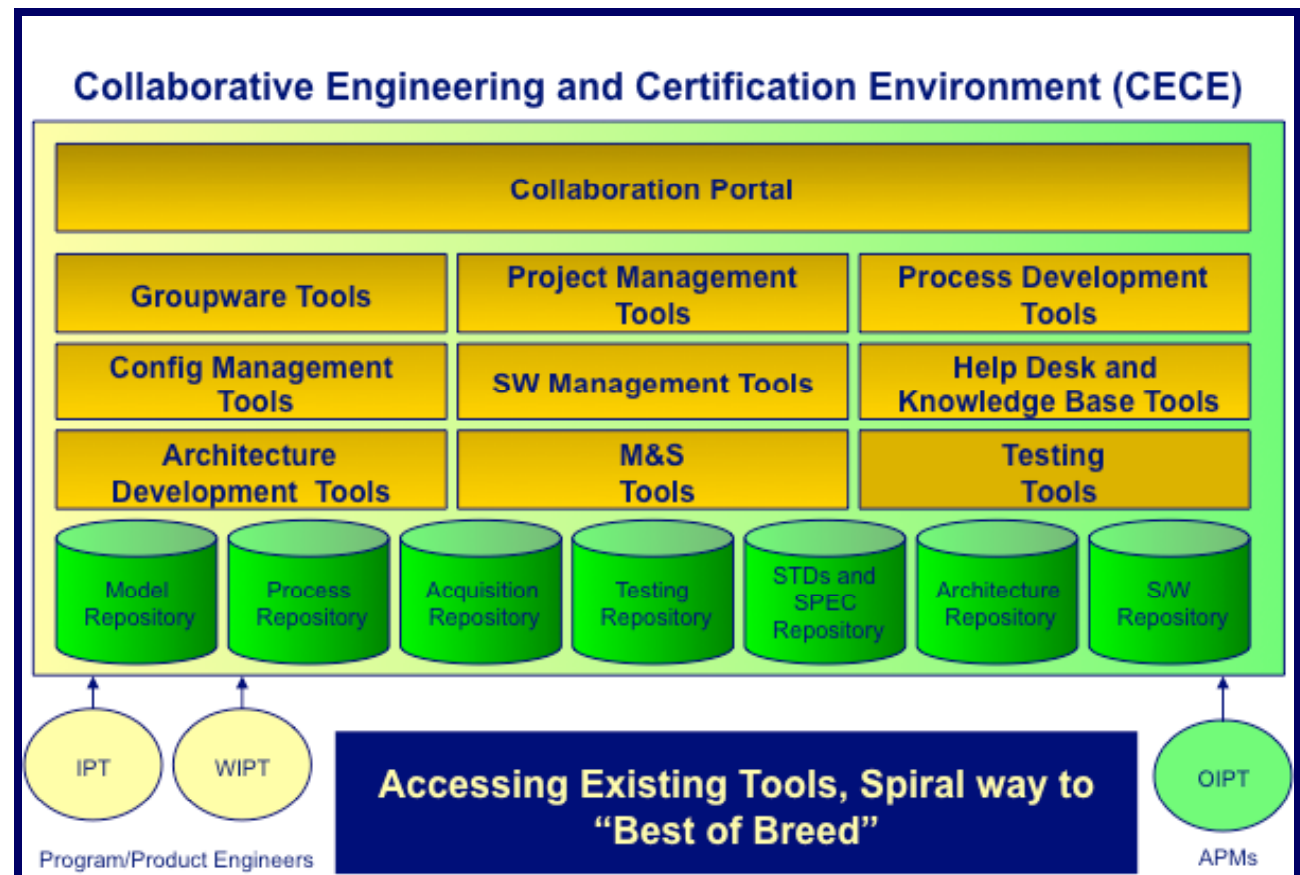
## Core Services Reference *Model* (CS-RM)

CS-Service Reference Model  
CS-Infrastructure Reference Model

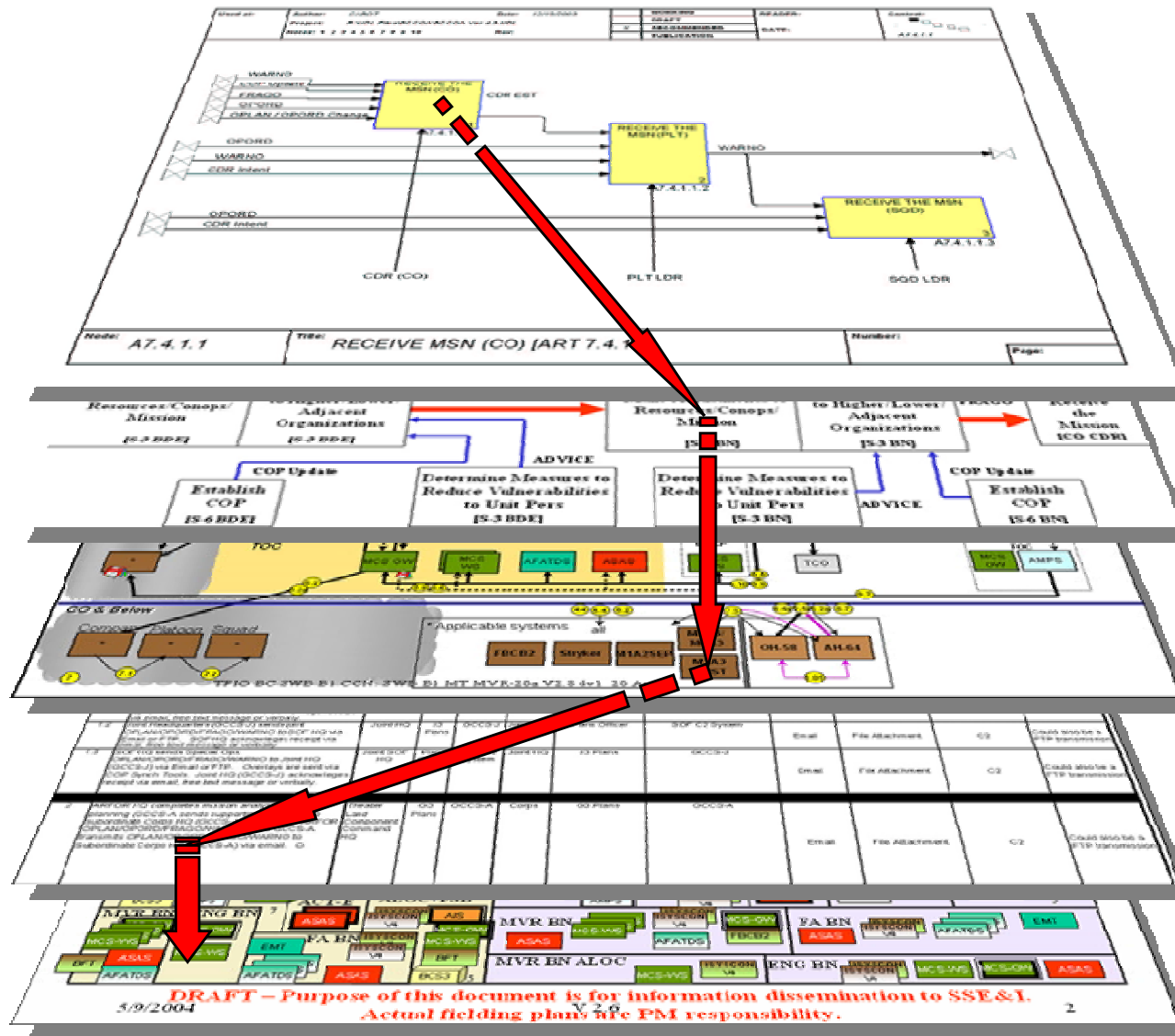


# Engineering Governance Enabler

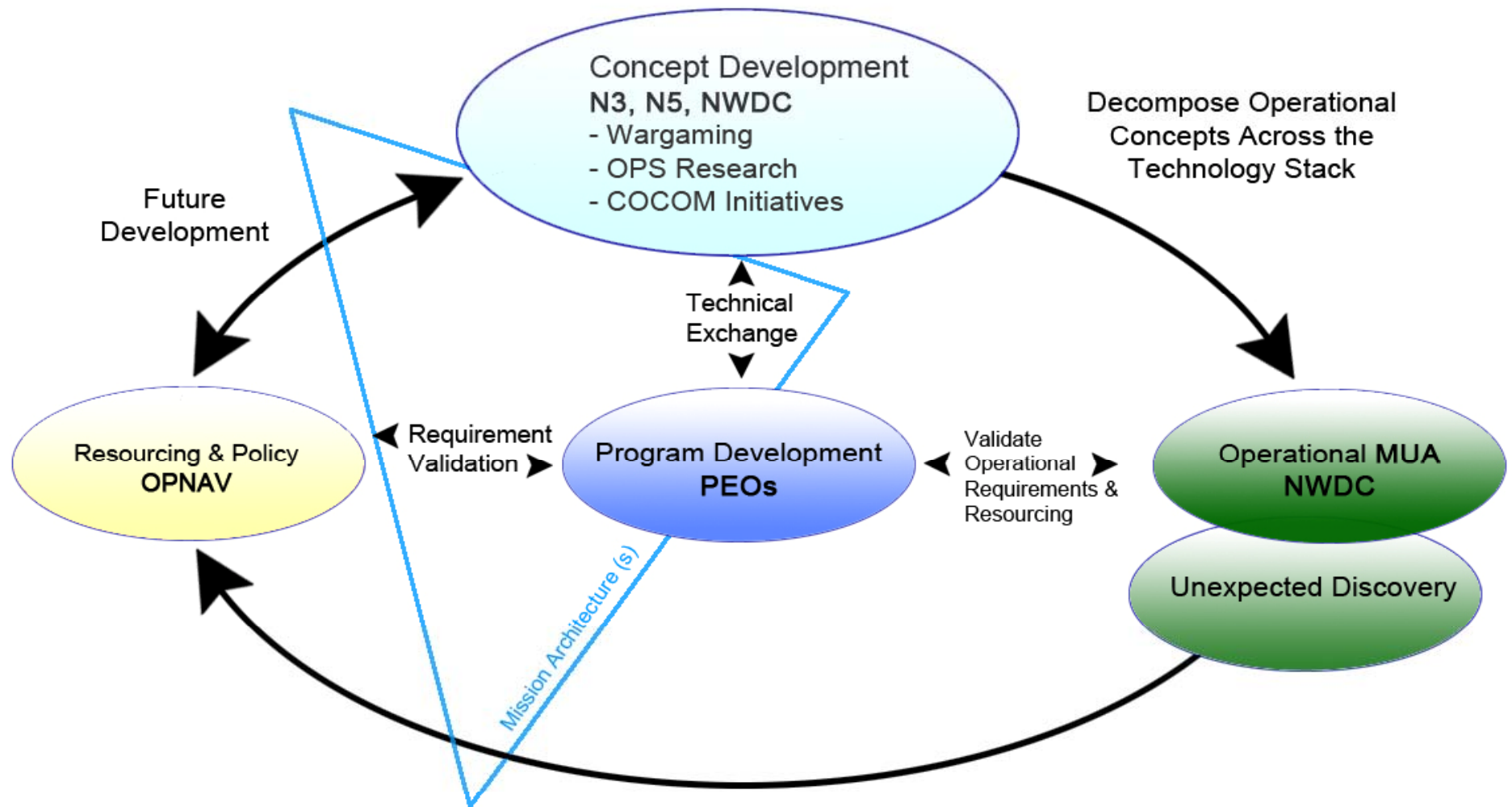
- Engineering Governance is enabled by **collaboration** and the **co-evolution** of tools and engineering processes to support **interoperability**
- **Co-evolution** requires a flexible Collaborative Engineering and Certification Environment (CECE)
- A CECE is a key **collaboration & re-use enabler**
  - Discovery
  - Context
  - Service Descriptions
  - Unintended Consumer (\$\$\$\$)
  - Scalability and Extensibility
  - Interfaces



# Guiding Composition



# Linking Innovation to Acquisition



# Summary - the challenge continues...

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- **Service Orientation is still evolving**
  - Design patterns, technologies, and implementation and support processes (including ITIL v3)
- **Understanding of Governance is still evolving**
  - *Engineering, Acquisition and Operational Governance* enables interoperability via flexible, transparent ,collaborative processes
  - Re-use goes beyond just code and applies to knowledge, processes, artifacts, approaches, and testing (*there is no single answer – apply a full spectrum of SSPPs*)
- **CECE provides the foundation for development agility**
  - Persistent engineering and test facility – transparency and collaboration
  - Alignment and traceability of Capability Modules and Mission Threads
  - Rapid assessment via experimentation and MUAs

*“SOA is not the answer to everything; one SOA is not the answer to anything”*

# List of Acronyms

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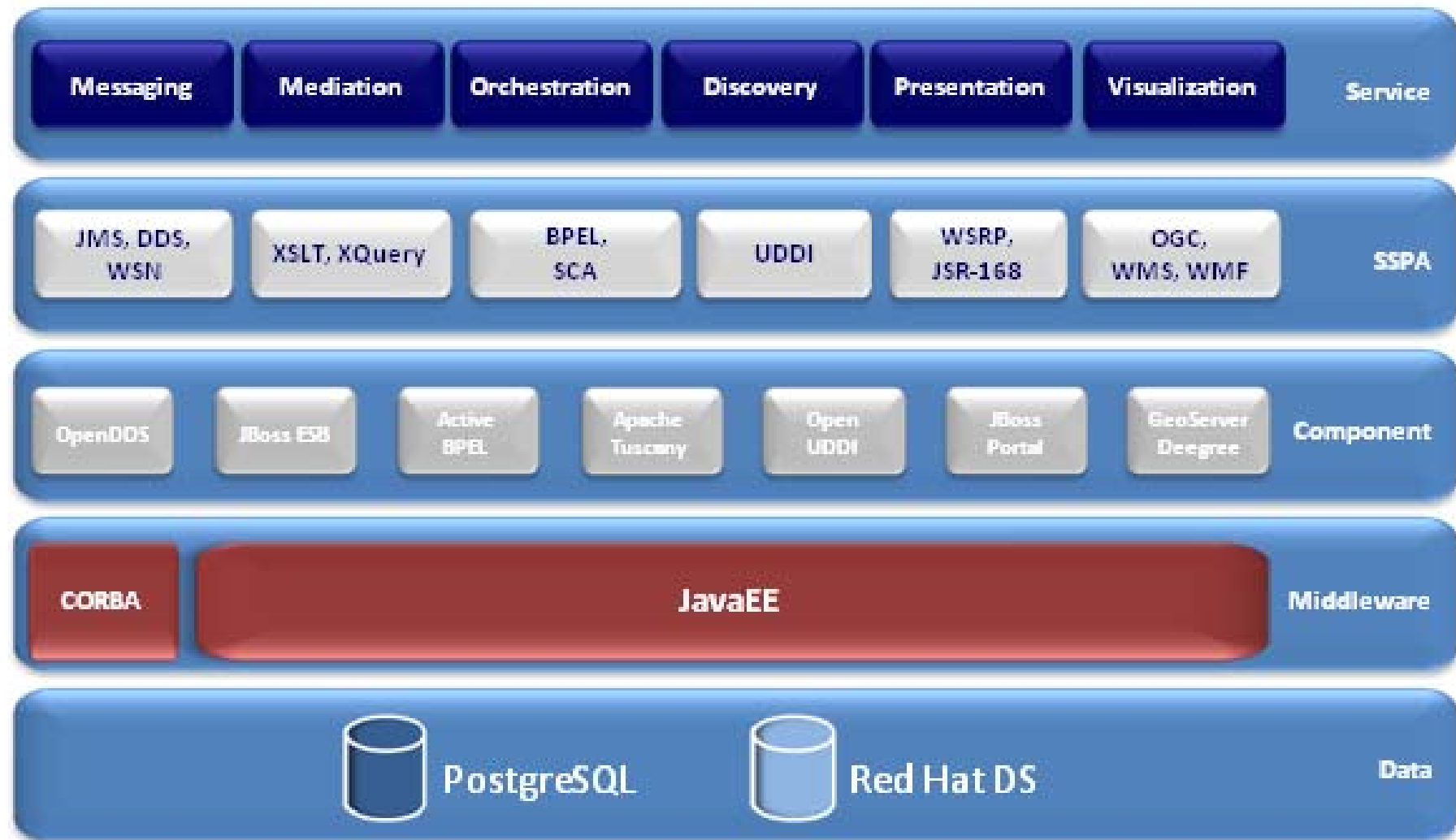
- SOA – Service Oriented Architecture
- C2 – Command & Control
- ISRT – Intelligence, Surveillance, Reconnaissance & Targeting
- MP – Mission Planning
- L – Logistics
- NC – Net-Centric
- ONR – Office of Naval Research
- OPNAV – Navy Echelon 1 resource organization
- NWDC – Naval Warfare Development Command
- PEO – Program Executive Officer
- CECE – Collaborative Engineering & Certification Environment
- CES – Core Enterprise Services
- CCE – Common Computing Environment
- CPM – Capability Portfolio Management
- ITIL v3 – Information Technology Infrastructure Library version 3
- MUA – Military Utility Assessment
- SSPP – Standards, Specifications, Patterns and Practices
- CM – Configuration Management

# Questions & Answers

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# Navy SOA Reference Implementation



\* See ONRRI-SSPA.doc for supported Standards, Specifications, Protocols and API versions.

\* See ONRRI-Blueprints.doc for guidelines, patterns and code examples.